Contribution of ultrasound in the assessment of patients with suspect idiopathic pudendal nerve disease

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Aims and objectives

To assess if Ultrasound (US) is contributive in patients suspected of having idiopathic pudendal neuralgia.

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Methods and materials

We prospectively included 10 female patients (mean age: 47±14 years; mean body mass index: 24 ± 3) who were referred for high-resolution US between July 2012 and April 2013.

We evaluated patients with suspected pudendal nerve disease for whom a US examination was requested by the referring clinicians on the basis of the clinical evaluation, including doubtful or inconclusive clinical neurophysiology.

The patients (ten) were studied with US by two radiologists (A.T. and B.B.) who developed the US technique to study the pudendal nerve "in vivo" by means of high-resolution US. The two radiologists had 7 and 2 years respectively of experience in peripheral nerve imaging not only related to US imaging, but also related to Computed Tomography and Magnetic Resonance Imaging, including classical and advanced techniques.

At the time of US imaging, to avoid bias, the two radiologists were blinded with respect to the previous clinical (only the suspicion of pudendal neuralgia was known, but not the detailed report describing the Nantes criteria) and neurophysiological assessments.

Doubtful cases were discussed and resolved in consensus.

Concerning the assignment of the US contribution, an independent clinician with 7 years of experience in US imaging of peripheral nerves, who did not perform electrodiagnosis
and US, reviewed the clinical, neurophysiological and US data including follow-up data to determine the role of US.

*High-resolution US examinations*

US of the pudendal nerve was performed with a commercially available US equipment (iU22; Philips, Eindhoven, The Netherlands) using broadband transducers (linear probe 12-7 MHZ, and 17-5 MHZ).

*Qualitative and quantitative evaluation*

In addition to qualitative evaluation of the pudendal nerve, the quantitative evaluation included assessment of the mean cross-sectional area (CSA) of the nerve at the level of the ischial tuberosity and at the level of the distal branches. Comparison with normal values from our laboratory (mean cross-sectional area of the pudendal nerve: 5.9 ± 1.3 mm². Mean cross-sectional areas (CSA) of the terminal branches: 0.6 ±0.2 mm² for the inferior rectal nerve, 0.6 ±0.2 mm² for the perineal nerve, and 1.1 ± 0.3 mm² for the dorsal nerve of the clitoris) was made.

Comparison with the contralateral side was also made. Both static images and video-clips were used for diagnosis.

The pudendal nerve was considered to be pathological according to defined criteria validated in the literature for peripheral nerves (increased CSA in the compression site or related to extrinsic compression, focal or diffuse increased CSA, shape and echogenicity)

The contribution of US was assessed according to the classification reported in the literature with few modifications:

- **Contributive**: US allowed the identification of the nerve lesion, which had been previously suspected on the basis of the clinical and neurophysiological assessment. US added information confirming or modifying the diagnostic path.
- **Non-contributive**: US did not show pathological findings and did not add information, did not confirm or modify the diagnostic path.

*Results*
Ultrasound allowed identification of morphological alterations to the pudendal nerve in 7/10 of cases (70%).

Ultrasound allowed the identification of a possible cause of pain related to idiopathic pudendal nerve entrapment or to associated findings: in seven cases US revealed the presence of a diffusely or focally enlarged pudendal nerve which was confirmed by MRI.

In these seven cases, neurophysiological findings were suspicious for pudendal neuralgia in 5/7 cases, whereas in 2/7 cases neurophysiological findings were considered inconclusive by the referring clinician.

In every patient of this group, US was able to correctly identify the nerve on the affected side and to differentiate the normal from the pathological nerve.

In one case, US was able to identify a calcification near the coccyx that after treatment was considered to be the cause of pain. In this case neurophysiological findings were unable to reach a definite diagnosis.

In the remaining two cases neither neurophysiological findings or US findings were able to rule out the cause of pain. In these two cases US was considered non-contributive. In one of these patients, MRI was able to identify, on the symptomatic side, a hyperintense pudendal nerve on fluid sensitive sequences consistent with intraneural edema. In the other case, the diagnosis remained undetermined.

Table 1 and Figure 1-3 explains the results from a graphical point of view.

**Images for this section:**
**Table 1:** This table shows the main data of the patients which were included in the study.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Clinical picture</th>
<th>EMG/ENG diagnosis</th>
<th>US diagnosis</th>
<th>Pudendal nerve cross-sectional area (mm²)</th>
<th>Further diagnostic data confirming US</th>
<th>Final diagnosis</th>
<th>Contribution of US</th>
<th>Does it modify therapeutic decision?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>44</td>
<td>Buttock pain on sitting</td>
<td>Axonal involvement of all muscles innervated by the pudendal nerve, increased motor distal latency and altered sensory latencies and conduction velocities</td>
<td>Increased CSA and hypoechoogenicity</td>
<td>7.4</td>
<td>MRI</td>
<td>Pudendal neuralgia</td>
<td>Contributitive</td>
<td>Yes, identifying site and type of infiltrative procedure</td>
</tr>
<tr>
<td>2</td>
<td>46</td>
<td>Prevalent coccygeal pain</td>
<td>Normal findings</td>
<td>Normal appearance of the pudendal nerve</td>
<td>4.8</td>
<td>MRI and X-ray</td>
<td>Coccygeal calcification</td>
<td>Contributitive</td>
<td>Yes, identified an alternative diagnosis</td>
</tr>
<tr>
<td>3</td>
<td>35</td>
<td>Severe pain from the anus to the clitoris</td>
<td>Fibrillation potentials and neurogenic recruitment limited to the external anal sphincter, increased distal latency and altered sensory latencies and conduction velocities</td>
<td>Increased CSA and hypoechoogenicity</td>
<td>9.6</td>
<td>MRI</td>
<td>Pudendal neuralgia</td>
<td>Contributitive</td>
<td>Yes, identifying site and type of infiltrative procedure</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>Pain and burning sensation</td>
<td>Mononeuropathy of the pudendal nerve</td>
<td>Increased CSA and hypoechoogenicity</td>
<td>6.7</td>
<td>MRI</td>
<td>Pudendal neuralgia</td>
<td>Contributitive</td>
<td>Yes, identifying site and type of infiltrative procedure</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>Pain and burning sensation</td>
<td>Mononeuropathy of the pudendal nerve (considered inconclusive by the referring clinician)</td>
<td>Increased CSA</td>
<td>6.9</td>
<td>MRI</td>
<td>Pudendal neuralgia</td>
<td>Contributitive</td>
<td>Yes, identifying site and type of infiltrative procedure</td>
</tr>
<tr>
<td>6</td>
<td>26</td>
<td>Discomfort while sitting</td>
<td>Normal findings</td>
<td>Normal appearance</td>
<td>4.6</td>
<td>Nothing</td>
<td>Undetermined</td>
<td>Non contributive</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>55</td>
<td>Pain and burning sensation</td>
<td>Mononeuropathy of the pudendal nerve</td>
<td>Increased CSA and hypoechoogenicity</td>
<td>7.8</td>
<td>MRI</td>
<td>Pudendal neuralgia</td>
<td>Contributitive</td>
<td>Yes, identifying site and type of infiltrative procedure</td>
</tr>
<tr>
<td>8</td>
<td>52</td>
<td>Pain and burning sensation</td>
<td>Mononeuropathy of the pudendal nerve (considered inconclusive by the referring clinician)</td>
<td>Increased CSA</td>
<td>8.3</td>
<td>MRI</td>
<td>Pudendal neuralgia</td>
<td>Contributitive</td>
<td>Yes, identifying site and type of infiltrative procedure</td>
</tr>
<tr>
<td>9</td>
<td>70</td>
<td>Severe pain from the anus to the clitoris</td>
<td>Mononeuropathy of the pudendal nerve and fibrillation potentials and neurogenic recruitment limited to the external anal sphincter</td>
<td>Increased CSA and hypoechoogenicity</td>
<td>7.2</td>
<td>MRI</td>
<td>Pudendal neuralgia</td>
<td>Contributitive</td>
<td>Yes, identifying site and type of infiltrative procedure</td>
</tr>
<tr>
<td>10</td>
<td>34</td>
<td>Pain and burning sensation</td>
<td>Normal findings</td>
<td>Normal appearance</td>
<td>6.0</td>
<td>MRI</td>
<td>Pudendal neuralgia</td>
<td>Non contributive</td>
<td>No, it does not modify therapeutic decision. Only MRI demonstrated intraneural edema</td>
</tr>
</tbody>
</table>
Fig. 1: US images of a 35 year-old woman with severe pain at the level of posterior and anterior perineum (case 3 of Table 1). Oblique high-resolution US shows a focal area of enlargement and hypoecogenic area along the course of the pudendal nerve (white arrow) at the level of the distal Alcock canal. The US image of the contralateral side in the right panel demonstrates a normal pudendal nerve (arrowheads). Cross-sectional areas were: 9.6 mm² for the affected side and 4.8 mm² for the normal contralateral side. The images were obtained using a medial approach. In the MRI image obtained with fluid-sensitive sequences note the markedly hyperintense pudendal nerve on the affected side (white arrow) in which a focal area of enlargement is evident. EMG/ENG showed fibrillation potentials and neurogenic recruitment limited to the external anal sphincter and increased distal latency (4.4 msec on the affected side versus 1.2 msec on the contralateral side) and a reduced potential amplitude on the affected side (0.5 mV versus 1.3 mV on the contralateral side). Sensory nerve action potential and sensory conduction velocity were abnormal as well.
Fig. 2: US images of a 46 year-old woman with coccygeal pain and pain at the level of posterior perineum (case 2 of Table 1). Oblique high-resolution US shows a calcific deposit at the level of the coccyx (white arrowheads). The US image showed a normal pudendal nerve (not shown). In the MRI images obtained with anatomical T1-weighted sequences and fluid sensitive sequences the soft tissue alterations related to the calcific deposit are shown (white arrowhead).
**Fig. 3:** US images of a 34 year-old woman with pain and burning sensation at the level of posterior and anterior perineum (case 10 of Table 1). Oblique high-resolution US shows normal pudendal nerve on both sides. In the MRI image obtained with fluid sensitive sequences note the markedly hyperintense pudendal nerve on the affected side (white arrow). In this case US was non contributive. EMG/ENG showed normal findings.
Conclusion

In conclusion, this study demonstrated that US is contributive in patients suspected of having idiopathic pudendal neuralgia. This data support the encouraging results obtained on US evaluation of peripheral nerves. In addition, the pudendal nerve is a difficult nerve to be evaluated with US and great technical challenges had to be solved to obtain reliable US images. We believe that high-resolution US has the potential to be useful for those patients suspected of having idiopathic pudendal neuralgia. Moreover, US compared to MRI, is fast, cheaper, widely available and it is a good first-line imaging approach. Our study suggests that US evaluation of the pudendal nerve is contributive for the majority of patients suspected of having idiopathic pudendal neuralgia.

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References


